

Remarks

Claims 1-13 are pending in this application. Claims 6-9 are withdrawn from consideration. Original claims 1-5 and 10-13 were rejected. Claims 1, 3, 10 and 11 have been amended to more particularly point out the invention. Specifically, these claims have been amended to more clearly point out that the reductant is injected at a location immediately adjacent to the flow control valve, and that there is a pressure drop across the flow control valve that results in turbulent flow in a region immediately adjacent to the flow control valve that includes the reductant injection location, thereby causing mixing of the reductant and the exhaust gas in a relatively short distance. The invention, as defined by the claimed combinations, including this specifically recited feature, is believed to be patentable.

The invention relates to an internal combustion engine that includes a NO_x adsorber. Applicant recognized that for good regeneration, it is desired that the fuel (or other injected substance) be well mixed with the exhaust flow before entering the aftertreatment device. To improve the mixing, the current practice is to inject at an elbow, allow a long length of piping after the fuel is injected before entering the aftertreatment device, or a combination of these or other mixing schemes.

The invention provides an improved approach wherein the reductant is injected at a location slightly upstream, slightly downstream, or directly in the flow control valve to improve mixing of the reductant and the exhaust gas before entering the NO_x adsorber. That is, the reductant is injected at a location immediately adjacent to the flow control valve, and there is a pressure drop across the flow control valve that results in turbulent flow in a region immediately adjacent to the flow control valve, thereby causing improved mixing of the reductant and the exhaust gas in a relatively short distance. All claims currently under consideration recite combinations including this particular feature.

In rejecting original claims 1-5 and 10-13, the Examiner relies on Stroia et al (US 6,735,940). Stroia does describe an adsorber aftertreatment system having dual adsorbers.


Reply to Office Action of October 15, 2004

Stroia does describe first and second dual adsorber arrangements. However, Stroia does not describe or suggest the particularly claimed feature relating to the injection of the reductant at a location immediately adjacent to the flow control valve, wherein there is a pressure drop across the flow control valve that results in turbulent flow in a region immediately adjacent to the flow control valve that includes the reductant injection location, thereby causing mixing of the reductant and the exhaust gas in a relatively short distance. Stroia only describes a fuel injector positioned to inject a measured quantity of fuel into the exhaust gas flow entering the adsorber, but fails to describe or suggest the specifically claimed details of Applicant's invention. The Examiner makes reference to column 4, lines 20-67 of Stroia, but this section of Stroia only describes fuel injection into the exhaust gas flow, and fails to specifically suggest the claimed invention. After all, Applicant contends that, with regard to injection location, Stroia at most only suggests the current practice of injecting at an elbow, allowing a long length of piping after the fuel is injected before entering the aftertreatment device, or a combination of these or other mixing schemes, and fails to suggest the claimed invention.

For the reasons given above, the invention is believed to be patentable, and allowance of claims 1-5 and 10-13 is respectfully requested.

Respectfully submitted,

KEVIN DEAN SISKEN

By 
Jeremy J. Curcure
Reg. No. 42,454
Attorney for Applicant

Date: January 7, 2005

BROOKS KUSHMAN P.C.
1000 Town Center, 22nd Floor
Southfield, MI 48075-1238
Phone: 248-358-4400
Fax: 248-358-3351